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ART 34 AMDT

CLAIMS

1. An actuator device, characterized by:

a drive motor;

5 a power transmission mechanism coupled to the drive motor;

an output shaft coupled to the power transmission mechanism, rotation of the drive motor is transmitted to the output shaft via the power transmission mechanism;

10 a sensor for detecting the rotation angle of the output shaft;

a connector terminal connected to an external connector;

a power supply terminal, which is connected to the drive motor and supplies electric power to the drive motor, wherein

15 the sensor, the connector terminal, and the power supply terminal are electrically connected to one another, electric power is supplied to the drive motor from the outside and a rotation angle signal obtained by the sensor is sent to the outside via the external connector and the connector terminal;

20 a sensor accommodating portion for accommodating the sensor;

a connector portion including the connector terminal;
and

25 a power supply portion including the power supply terminal, and the sensor accommodating portion, the connector portion, and the power supply portion are integrally formed.

2. An actuator device, characterized by:

a drive motor;

30 a power transmission mechanism coupled to the drive motor;

an output shaft coupled to the power transmission mechanism, rotation of the drive motor is transmitted to the output shaft via the power transmission mechanism;

35 a sensor for detecting the rotation angle of the output

shaft;

a connector terminal connected to an external connector;
a power supply terminal, which is connected to the drive
motor and supplies electric power to the drive motor, electric

5 power is supplied to the drive motor from the outside and a
rotation angle signal obtained by the sensor is sent to the
outside via the external connector and the connector terminal;

a sensor accommodating portion for accommodating the
sensor;

10 a connector portion including the connector terminal;

a power supply portion including the power supply
terminal, and the sensor accommodating portion, the connector
portion, and the power supply portion are integrally formed;
and

15 a first case and a second case, the first and second
cases holding the connector portion.

3. The actuator device according to claim 1 or 2,
characterized in that the power transmission mechanism
20 includes a plurality of gears, one of the gears has the output
shaft and includes a recess for accommodating the sensor
accommodating portion.

4. The actuator device according to claim 3,
25 characterized in that the gear having the recess has a
cylindrical gear portion, and the cylindrical gear portion
defines the recess.

5. The actuator device according to any one of claims
30 1 to 4, characterized in that the sensor accommodating portion,
the connector portion, and the power supply portion form a
single substantially L-shaped assembly.

6. The actuator device according to any one of claims
35 1 to 4, characterized in that the sensor accommodating portion,

the connector portion, and the power supply portion are molded using resin to form a single assembly.

7. The actuator device according to claim 6,
5 characterized in that the power supply terminal and the connector terminal are integrally incorporated in the assembly.

8. The actuator device according to any one of claims
1 to 4, characterized in that the power supply terminal and
10 the connector terminal are formed of a single conductive plate, the conductive plate further including a wiring portion, the wiring portion including a connecting portion, which is connected to the sensor, and a coupling portion, which can be arbitrarily cut, and the connecting state among the connecting
15 portion, the connector terminal, and the power supply terminal is determined in accordance with the cutting state of the coupling portion.

9. The actuator device according to claim 8,
20 characterized in that the sensor accommodating portion, the connector portion, and the power supply portion form a single assembly, the assembly being molded using resin to integrally incorporate the conductive plate.

25 10. The actuator device according to claim 9, characterized in that the assembly is molded such that the wiring portion is exposed to the outside.

11. The actuator device according to any one of claims
30 1 to 10, characterized in that the power transmission mechanism includes a motor gear attached to a rotary shaft of the drive motor and a plurality of gears forming a series of gears coupled to the motor gear, and at least one of the gears, which form the series of gears, integrally includes a
35 depression portion for depressing the gear in the axial

direction.

12. The actuator device according to claim 11,
characterized in that the gear including the depression
5 portion has a shaft portion, and the depression portion is
located radially outward of the shaft portion.

13. The actuator device according to claim 12,
characterized in that the gear including the depression
10 portion further includes:

a small diameter gear portion located on the shaft
portion;

a cylindrical large diameter gear portion located
radially outward of the shaft portion; and

15 a coupling portion, which radially extends between the
shaft portion and the large diameter gear portion to
integrally couple the large diameter gear portion to the shaft
portion,

wherein the depression portion extends from the coupling
20 portion in the circumferential direction of the corresponding
gear.

14. The actuator device according to claim 11,
characterized in that the gear including the depression
25 portion has a small diameter gear portion and a large diameter
gear portion, which are integrally formed with each other, and
the depression portion is provided on the large diameter gear
portion to be located radially outward of the small diameter
gear portion.

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15. The actuator device according to claim 13 or 14,
characterized in that the motor gear is a worm, and the large
diameter gear portion is a worm wheel engaged with the worm.

35 16. The actuator device according to any one of claims

11 to 15, characterized in that the depression portion is one of a plurality of depression portions arranged at equal angular intervals about the axis of the corresponding gear.

5 17. The actuator device according to any one of claims 11 to 16, characterized by a housing, which has a receiving surface for slidably receiving the depression portion, the receiving surface has a recess for accommodating lubricant agent at a position corresponding to a sliding path of the
10 depression portion.

 18. The actuator device according to claim 17, characterized in that the recess is groove-like and extends to be inclined with respect to the radial direction of the
15 corresponding gear.

 19. An actuator device, comprising:
 a drive motor, which has a rotary shaft;
 a motor gear attached to the rotary shaft;
20 a plurality of gears forming a series of gears coupled to the motor gear; and
 an output shaft coupled to the series of gears, rotation of the rotary shaft is transmitted to the output shaft via the series of gears,
25 the actuator device being characterized in that at least one of the gears, which form the series of gears, integrally includes a depression portion, which depresses the gear in the axial direction, and the depression portion applies load on the rotary shaft in a direction that intersects the axis of
30 the rotary shaft.

 20. The actuator device according to claim 19, characterized in that the gear including the depression portion has a shaft portion, and the depression portion is
35 located radially outward of the shaft portion.

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21. The actuator device according to claim 20,
characterized in that the gear including the depression
portion further includes:

5 a small diameter gear portion located on the shaft
portion;

a cylindrical large diameter gear portion located
radially outward of the shaft portion; and

10 a coupling portion, which radially extends between the
shaft portion and the large diameter gear portion to
integrally couple the large diameter gear portion to the shaft
portion,

15 wherein the depression portion extends from the coupling
portion in the circumferential direction of the corresponding
gear.

22. The actuator device according to claim 19,
characterized in that the gear including the depression
portion has a small diameter gear portion and a large diameter
20 gear portion, which are integrally formed with each other, and
the depression portion is provided on the large diameter gear
portion to be located radially outward of the small diameter
gear portion.